In partnership with ESI MOTION™

Olsen Actuators

DRACO

Dual-Axis Servo Drive

Rugged
Flexible
High Power Density

Olsen Actuators brings you ESI Motion's Draco Servo Drive, building upon the success of the flagship Dragon servo motor line with size and weight reductions and performance increases and utilising state-of-the-art wide bandgap technology.

It is available in multiple configurations to fit a myriad of applications. Draco incorporates our rugged, high-density DSP controller and power driver modules, offers several feedback options, and is packaged in a military-grade submersible case.

This versatile servo drive is ideal for high-performance applications operating outdoors, at high temperatures, in high vibration, or other extreme environmental conditions. It comes with an industry benchmark Graphical User Interface, allowing the most flexible and precise system integration and control.

ESI Motion's servo drive systems are designed for precision military, aviation, automotive, robotics, and specialised industrial applications where size and weight are critical. ESI Motion products are designed and built at our USA facility.

Features:

- Nominal Vbus options: 300VDC or 600VDC
- Maximum continuous output current 40A per axis (80A for Paralleled axes model)
- Maximum DC power to 29 kW
- Multiple feedbacks supported, including BiSS-C, Quadrature Encoder, Resolver, Hall and Sensorless
- Maximum motor speed 75,000 RPM
- Torque, velocity, or position control
- Shock and vibration tolerant construction
- Brake drivers
- Reverse polarity protection
- MIL-STD-461 EMI filter
- Regeneration switch
- Active inrush limiter
- Includes configurable, user-friendly GUI with enhanced data collection capability and integrated oscilloscope feature

Specifications:

- Weight:
  - Single-channel - 5.36lbs.
  - Dual-channel – 5.57lbs.
- Size: 9.38 in x 6.63 in x 2.60 in
- Nominal motor phase current: up to 60A*
- Efficiency: >97% (full load)
- Operating temperature: -40 to 71°C

Compliance (Flight Units):

- Software design assurance: DO-178C Option
- Electromagnetic interference per MIL-STD-461:
  - CE102
  - CS101
  - CS114
  - CS115
  - CS116
  - RE101
  - RE102
  - RS103
- Environmental qualification per MIL-STD-810G:
  - Random Vibration 514.7 Category 12 (X, Y & Z axes): 16.3 Grms, 15 – 2,000 Hz (0.20 g2/Hz)
  - Shock Time History 516.7 Procedure 1 (X, Y & Z axes): 40G Terminal Peak Sawtooth, 11ms
- 28V Electrical power characteristics: MIL-STD-704F

Customisation Available

Olsen Actuators and ESI Motion have the expertise to customise a solution for your project's needs. Contact us today at info@olsenactuators.com to see how we can tailor a solution for you.

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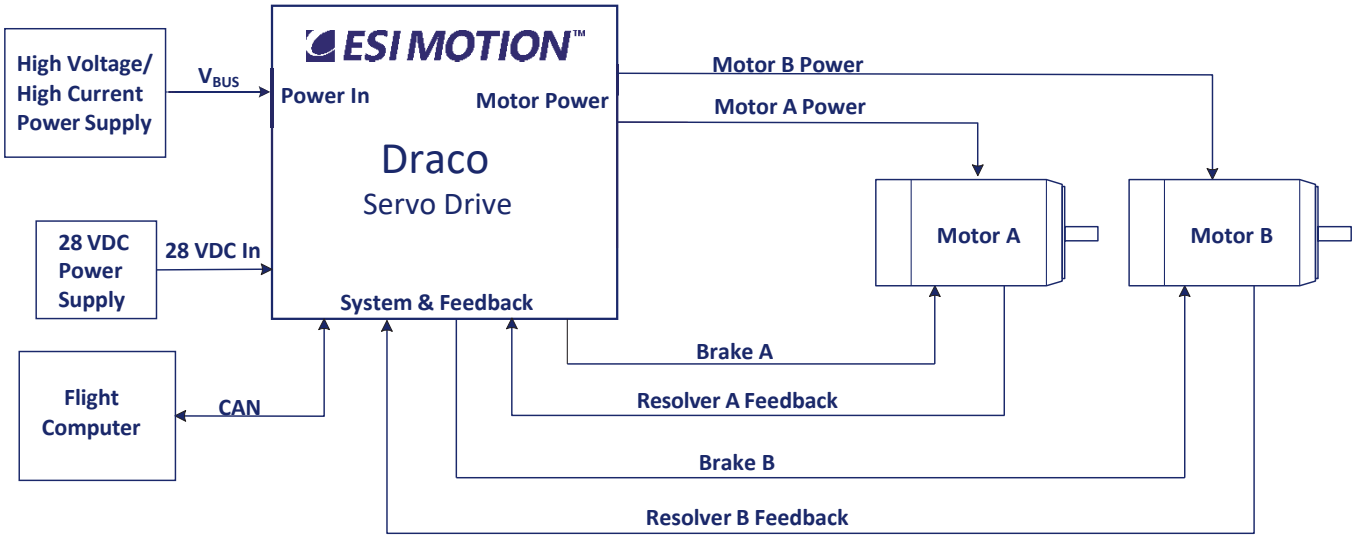
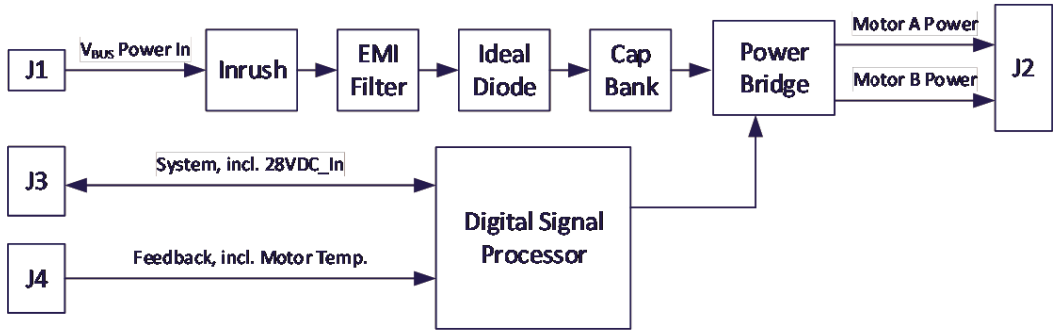
Typical Draco Application:

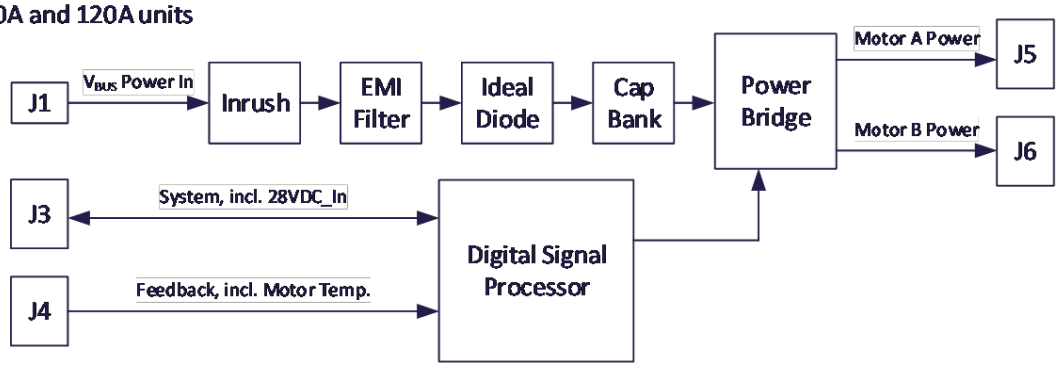


Draco Block Diagram:

20A and 40A units



60A and 120A units



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Electrical Specifications

Absolute maximum values

Stresses above those listed under Absolute maximum ratings may cause permanent damage to the device.

Parameter	Max	Units
Bus voltage (V_{BUS}), 600V model	900	VDC
Bus voltage (V_{BUS}), 300V model	450	VDC
V_{LOGIC} digital I/O logic voltage input transient, per Mil-Std-704F	50	V
Hall inputs	5	V
Encoder/Biss-C inputs	14	V
Analogue inputs	±22	V
Resolver inputs	±22	V
Motor temperature sensor inputs	+2	V
Operating case temperature	-40 to +71	°C
Storage temperature	-55 to +100	°C

Recommended operating conditions

DC Input Characteristics				
Parameter	**Min**	**Nom**	**Max**	**Units**
V_{BUS} bus voltage, 600V model	50	600	725	VDC
V_{BUS} bus voltage, 300V model	50	300	400	VDC
V_{LOGIC} digital I/O logic voltage input	22	28	36	VDC
V_{LOGIC} current (1)			0.3	A
V_{LOGIC} current			3.5	A

Notes:

1. Not including brakes

Parameter (Per Axis)	Max	Units
Input power limit, 600V model	29	kW
Input power limit, 300V model	16	kW

Notes:

1. Power is limited by the EMI input filter current. Higher power customised solutions are available.

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Output Characteristics		
Parameter (Per Axis)	**Max**	**Units**
Continuous output current, 20A axis (1) (2)	20	A
Continuous output current, 40A axis (1) (2)	40	A
Continuous output current, 60A axis (1) (2) (3)	60	A
Continuous output current, 80A axis (1) (2)	80	A
Continuous output current, 120A axis (1) (2) (3)	120	A
Regeneration current	40	A
Motor Speed	75,000	RPM

Notes:

1. Peak sine wave
2. Output power may be limited by the maximum input current
3. Coming soon

I/O Characteristics				
Parameter	**Min**	**Nom**	**Max**	**Units**
Analogue input range (1)	-10		10	V
Analogue input impedance		200		kΩ
Analogue test point (TP) output range (1)	-2.5		+2.5	V
Analogue test point (TP) output impedance		100		Ω
Thermistor resistance at 25° C (1) (2)	1	5	10	kΩ
Resolver excitation output (1)	3.8	4	4.2	V_{RMS}
Resolver excitation output frequency (3)		5		kHz
Resolver SIN, COS input differential range (1)		2	3.5	V_{RMS}
Resolver SIN, COS input differential impedance		18.2		kΩ
Digital encoder inputs (1)	0		5	V
Hall inputs (1)	0		5	V
BiSS-C data inputs (1) (4)	0		5	V
BiSS-C clock output(1) (4)	3		5	V
	-40		+40	mA
Interlock short resistance	0		1 K	Ohm
Interlock open resistance	1 Meg			Ohm
5VDC out			500	mA
RS-422 (1) (5) (6)			1,000	Kbps

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CAN (1) (6) (7)			1,000	Kbps
USB 2.0 (1)			12	Mbps

Notes:
1. ESD protected
2. Recommended: NTC 5k thermistor, Epcos part # B57540G502F
3. Default resolver frequency is 5 kHz (contact ESI for custom frequencies)
4. Physical interface compliant to EIA-422-B
5. Compliant to EIA-422-B
6. Short circuit protection from -7 to +12V
7. Compliant to ISO 11898-2 specification

Mechanical Characteristics & Connectors

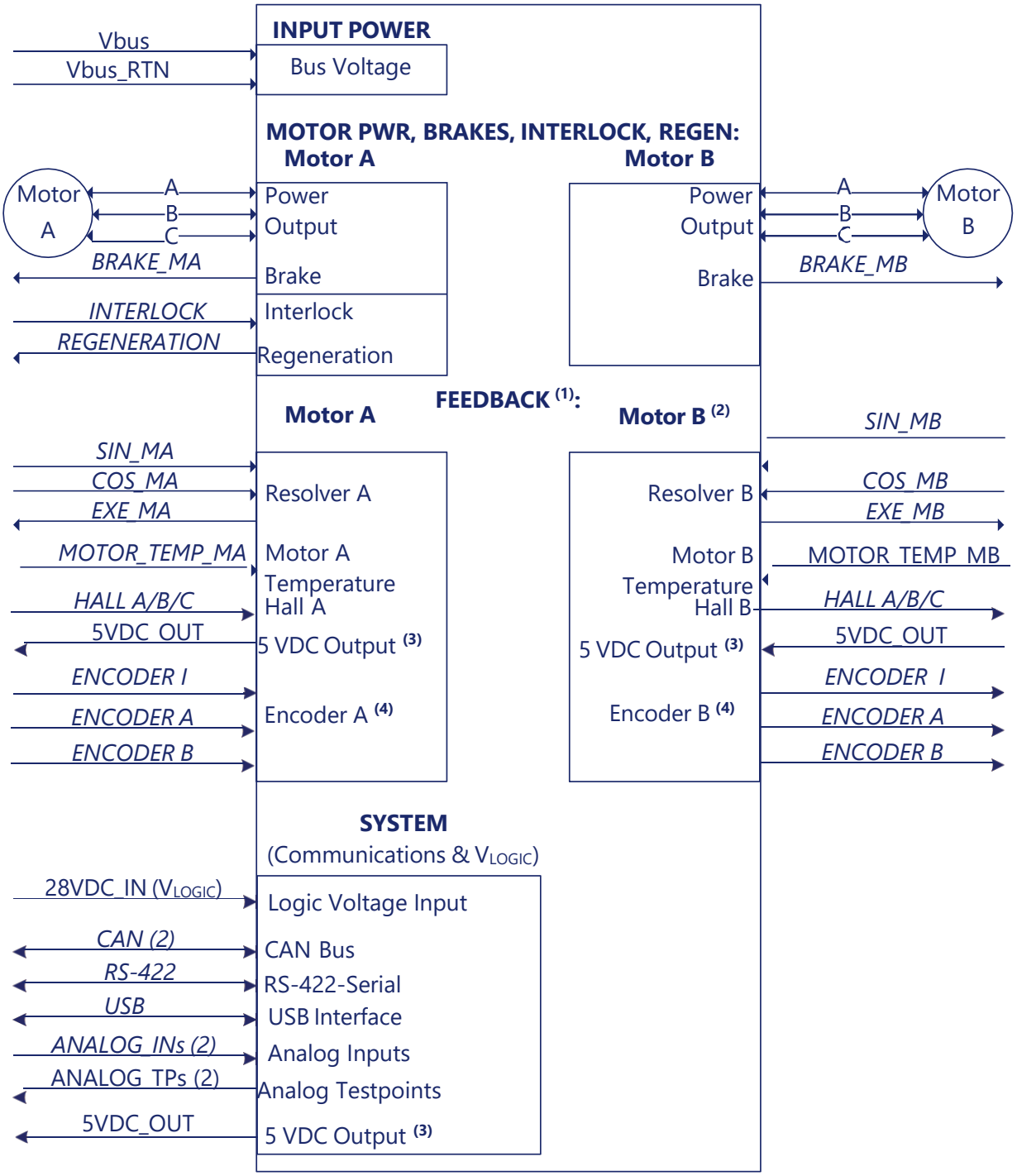
Mechanical Characteristics		
Parameter	**Value**	**Units**
Weight, conduction-cooled	5.36	lbs.
Size, conduction-cooled	9.38 x 6.63 x 2.60	Inches
Weight, liquid-cooled (1)	5.57	lbs.
Size, liquid-cooled (1)	9.38 x 6.63 x 3.10	Inches

Notes:
1. Preliminary coming soon

Connectors							
No.	Function	Insert Arrangement	Clocking	Number of contacts	Contacts size	Connector (contacts) (1)	Mating Connector (contacts) (2)
J1	Input Power	21-11	Normal	11	12	D38999/24FG11PN	D38999/26FG11SA
J2	Motor outputs (20A only)	21-11	Normal	11	12	D38999/24FG11SN	D38999/26FG11PN
J3	System	15-35	Normal	37	22D	D38999/24FD35PN	D38999/26FD35SN
J4	Feedback	17-35	Normal	55	22D	D38999/24FE35PN	D38999/26FE35SN
J5	Motor outputs (60A only)	21-11	Normal	11	12	D38999/24FG11SN	D38999/26FG11PN
J6	Motor outputs (60A only)	21-11	"A"	11	12	D38999/24FG11SA	D38999/26FG11PA

Notes:
1. 60A coming soon

Draco Interconnect Diagram



NOTES:

Signals shown in italics indicate differential (high and low) signal pairs

1. Feedback: Dual resolver shown (see J4 Connector table for other feedback options)
2. Available on Dual-axis model only
3. 5VDC_OUT: 500 mA max. total output
4. Encoder signals can be software reconfigured as BiSS-C signals

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Interfaces

Description Overview

The Draco servo drive incorporates our rugged controller and servo drive modules into a military-grade package. This section describes application interfaces for the Draco servo drive by functional group. The groups and their connectors are: Power Input (J1), Motor Power (J2), System Interface (J3), and Feedback (J4). High power (60A) (coming soon) units utilise two Motor Power connectors (J5 and J6).

Power Input ⟨J1⟩

Power Input is the high voltage/high current input, also referred to as V_{BUS} (for V_{LOGIC}, see System Interface below). The power signals are isolated from the control circuitry.

Motor Power ⟨J2⟩

Motor Power outputs three-phase power to the motor(s). For output current greater than 40A, both sets of motor power outputs are Paralleled. Two 24V brake drivers are provided (nominally 1A, and current limited to 1.5A ±10%). High Voltage (HV) interlock is a safety feature that can be used to prevent HV from being output unless the interlock signal and its return are shorted together (typically in a motor harness). Regeneration is a switched V_{BUS} output (limited to 15A).

System Interface ⟨J3⟩

The system signals are the main User Interface used in an end application. This interface includes low-level 28VDC power input (V_{LOGIC}) and several networking and discrete I/O signals. Networking has been emphasised in the communication interface to the Draco, which can connect to CAN Bus (highly recommended) or USB Serial interfaces. CAN Bus is ideal for real-time embedded networking, proven to be stable and robust, as well as flexible. (For RS-422 motor control, please contact ESI.) Using one of these interfaces, the Draco servo drive can easily be modified through software to accept commands and report feedback, without hardware modification, using the Host Interface for Drive/Servo Controller (HiDS, see next page). These interfaces have a defined software protocol and provide the user with complete flexibility in controller configuration, commands, and feedback.

The CAN physical interface is compliant to the ISO 11898-2 specification, with a maximum data rate of 1 Mbps for a bus length of up to 40 meters, and meets the extended common mode range of -7 to +12 V. *Note: for maximum system flexibility, no internal CAN bus termination is provided (see application diagram on pg. 2).*

The RS-422 physical interface is compliant to the TAI/EIA-422-B specification is capable of a 1 Mbps data rate, and is short circuit protected from -7 to +12 V. USB can be also used to re-program internal flash memory (a Flash update program is provided).

Digital and Analog Input/Output signals can be configured by ESI Motion's "HiDS" motor controller software tool for test control or status functions. The digital inputs are ESD protected to 2kV. These inputs may be configured through software as 'Control' or 'Test' inputs. In Control Mode, the signal may be used to give the Draco servo drive a torque or velocity command. For testing, the signal may be used to inject a test signal into the system.

The analogue inputs can be mapped to various control parameters and have a differential voltage input range of ± 10V. One use of analogue input is the Current Command, which is mapped and scaled through software configuration to the motor current or velocity control loop. This analogue input is provided to support legacy analogue systems (*ESI recommends the use of a serial command - CAN or USB*) on new implementations. The user may use HiDS to setup the four analogue test points for monitoring. The voltage range on the analogue test points is from -2.5 to +2.5V (buffered with a 100 Ohm resistor). Also provided are a 28 VDC fan output (for the fan-cooled configuration), and 5 VDC outputs (maximum 500 mA total).

Motor Feedback ⟨J4⟩

The Motor Feedback connections for Motor A (and Motor B, if Dual-axis) consists of feedback options, motor thermistor inputs, and 5 VDC outputs (maximum 500 mA total).

The Draco servo drive supports the following motor feedback devices: Resolver, Quadrature Encoder, Hall, BiSS-C, and Sensorless. Feedback options are software configurable via HiDS.

The temperature input is an active circuit that measures a negative temperature coefficient (NTC) thermistor, which is directly proportional to motor temperature. The temperature vs. resistance polynomial can be configured through software.

Mechanical Interface

The Draco is housed in a military-grade, rugged chassis. Military circular connectors ensure the Draco is ready for the harshest environments.

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ESI Motion's HiDS Application

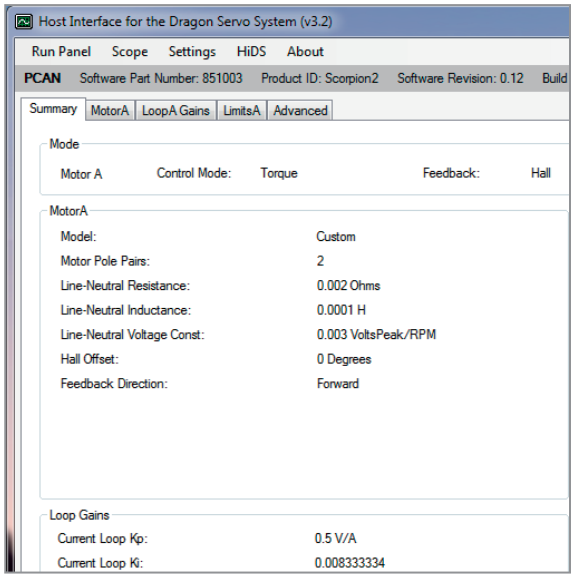
The Host Interface for Drive/Servo Controller (HiDS) is ESI Motion's servo motor controller software tool.

This innovative application allows users to configure a servo motor control system quickly and with a great deal of flexibility. It's based upon a configurable, user-friendly GUI, with an integrated oscilloscope feature. Extensive data collection and control allows system tuning and troubleshooting.

On Draco, the HiDS functions can be accessed via CAN. HiDS and the Controller User's Manual can be downloaded from ESI Motion's website at: www.esimotion.com/support/downloads

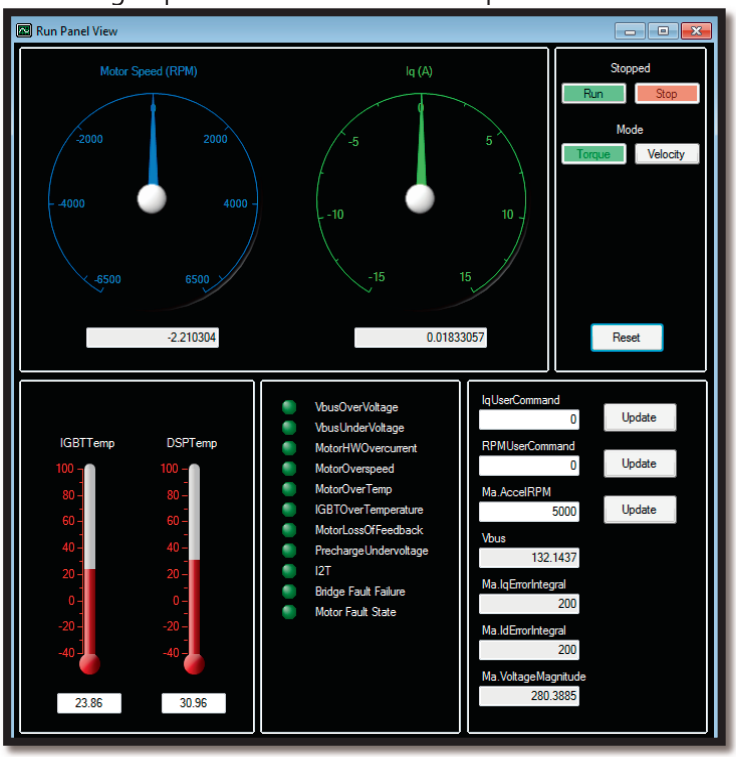
ESI's motion control products employ industry-standard current-loop, velocity-loop, and in some applications, a position-loop. Each of these control loops utilises Proportional, Integral, and Derivative (PID) error correction to achieve the desired performance. The Controller User's Manual includes a procedure for tuning each control loop to match the intended application. After the tuning is completed, additional initial configuration using feedback is described in detail.

The Controller User's Manual walks you through the steps to set up limits, enter motor parameters, and tune the motor using the desired loop configuration. An excerpt from the summary tab shown below is an example view of key device configuration parameters:

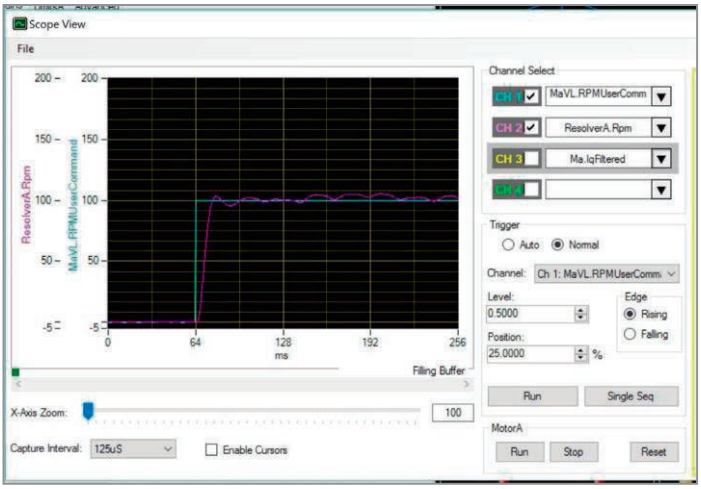


HiDS allows extreme flexibility via simply changing parameters, without the need to reload custom software.

The HiDS Run Panel facilitates control commands and monitoring of parameters such as motor speed and current:



A typical velocity-loop step response, displayed on the built-in oscilloscope function, is shown below:



The design of the ESI Motion Draco servo controller and HiDS tool allow for tremendous flexibility and capabilities in motor control and monitoring, to ensure success of the most challenging motion control applications.

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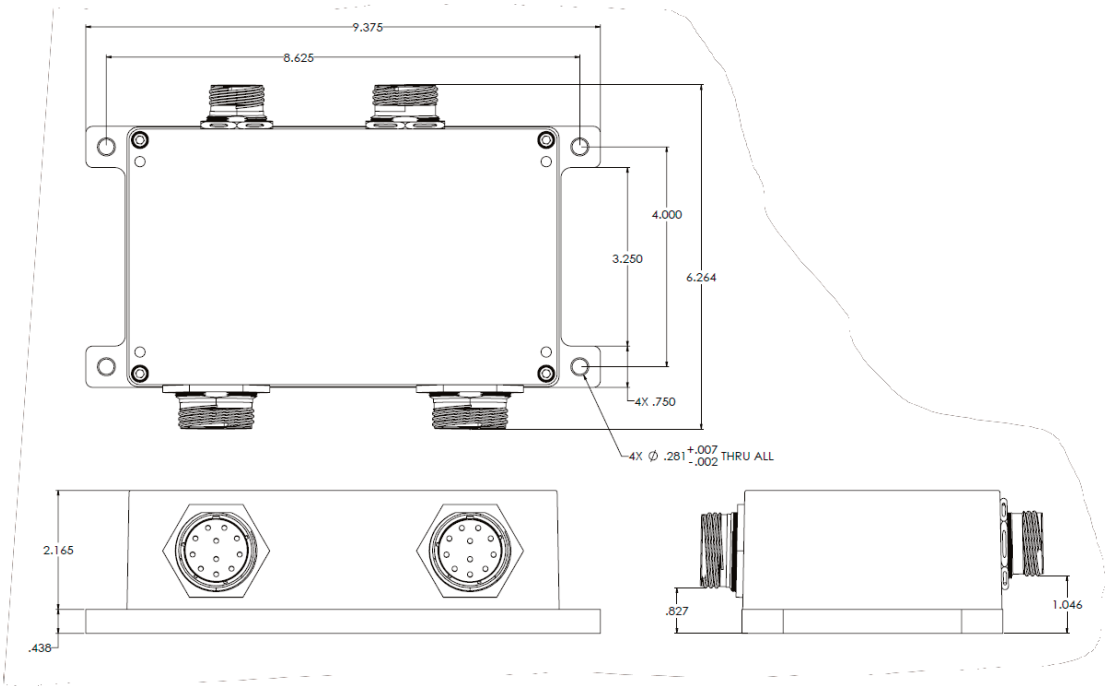
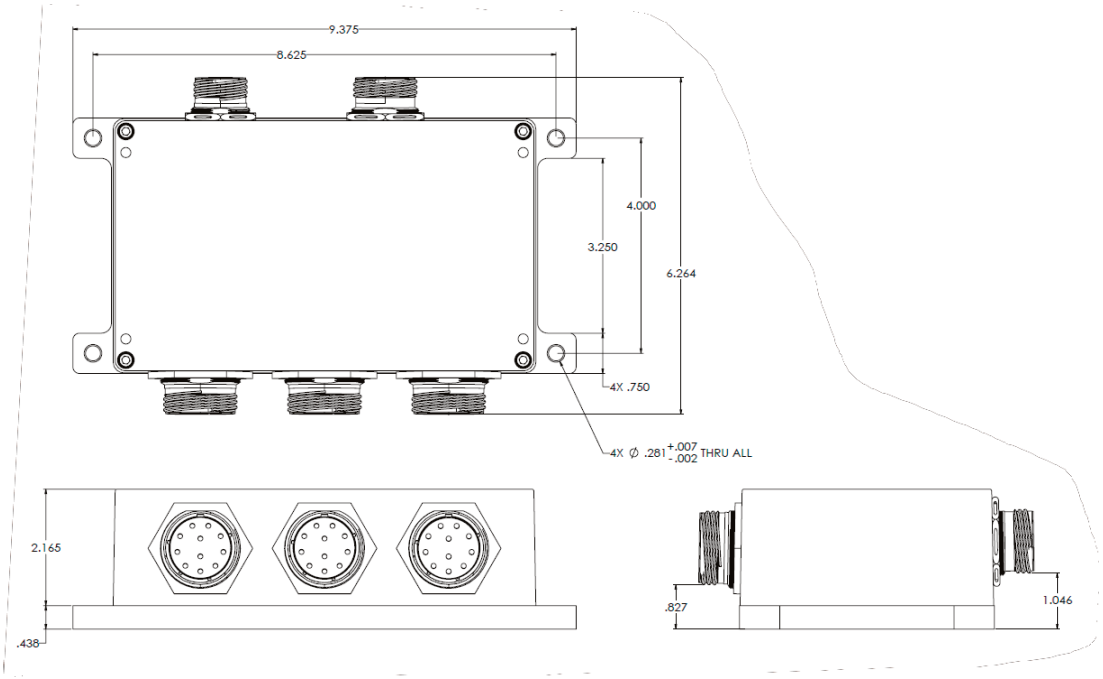
Envelope and Dimensions

Mechanical Diagram (Chassis Cooled) (Note: all dimensions are in inches)

20A Single-axis, 20A Dual-axis and 40A Paralleled Units



60A/40A Single-axis, 60A/40A Dual-axis and 120A/80A Paralleled Units
(60A/120A coming soon)



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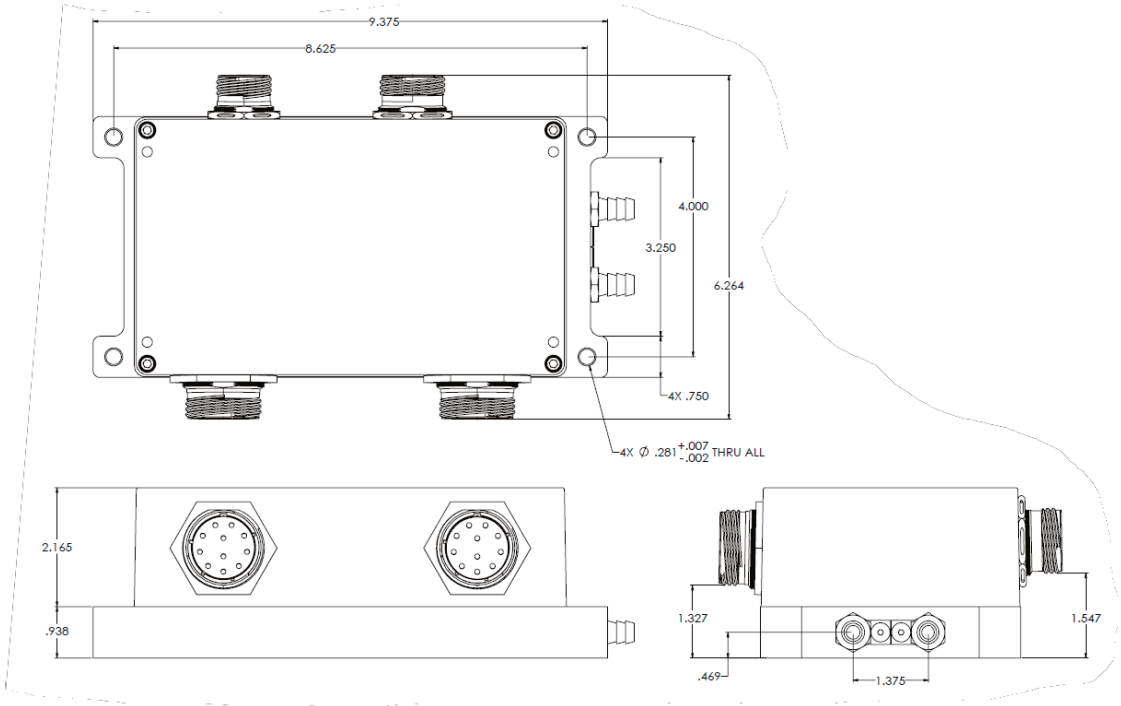
Mechanical Diagram (Liquid Cooled) *Cold plate design is preliminary

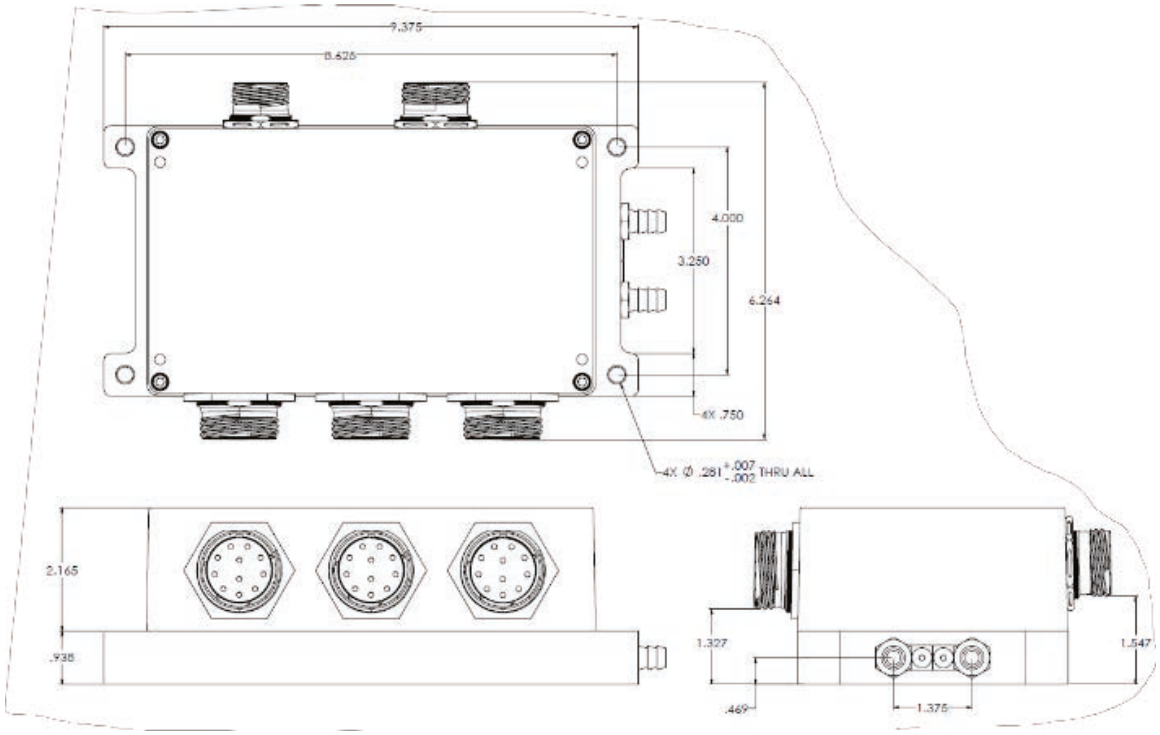
(Note: all dimensions are in inches)

20A Single-axis, 20A Dual-axis and 40A Paralleled Units



60A/40A Single-axis, 60A/40A Dual-axis and 120A/80A Paralleled Units

(60A/120A coming soon)



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ELECTRICAL INTERFACES

Signal and Voltages Descriptions

For details using HiDS and associated signals, please refer to the Controller User's Manual, downloadable from ESI Motion's website at: www.esimotion.com/support/downloads
For electrical characteristics, see; Recommended Operating Conditions and Absolute Maximum Values tables.

Name	I/O	Description
Vbus Input Power	I	Input Power that is used for V_{BUS} , i.e. converted to motor power
28VDC_IN (V_{LOGIC})	I	Input power that is used for powering the logic and control circuits, including brake
Motor Phase A/B/C	O	3-phase output power to motor
Brake X Power+/-	O	28V brake output, under software control. Hardware has the capacity of 6.25A maximum, however the current is limited by the maximum 28VDC_IN (V_{LOGIC}) current.
CAN+/-	I/O	CAN Bus differential serial communication: commands and status. CAN is the preferred communication, and is used in the DO-178C Baseline. Compliant to the ISO 11898-2 specification. Treat as open drain. Pulled up internally. Interface has internal 10KΩ termination. IMPORTANT NOTE: External 120-Ohm termination is required on the mating harness.
RS-422+/-	I/O	Alternate RS-422 Serial Bus differential serial communication: commands and status. Compliant to ANSI/TIA/EIA-422. Baud rate: 115200 bps. Interface has internal 200Ω termination. See also RS-422_GND, below. Note: Safety-Critical Software Baseline uses CAN. For RS-422 use, contact ESI Motion with your requirements.
RS-422_GND	--	Isolated RS-422 (Field) Ground (isolated from GND). Use of this connection is recommended for highest signal integrity.
Motor Temp X+/-	I	Two wire interface for a Resistance Temperature Detector (RTD). Recommended RTD: IEC 60751 Class B, 1KΩ (Contact ESI Motion for alternate devices)
Resolver X Excitation+/-	O	Resolver Excitation output (reference signal to a resolver)
Resolver X Sin/Cos+/-	I	Resolver inputs provide motor position information
CH_GND	--	Chassis (Case) Ground (connected to connector outer shells and mounting holes)

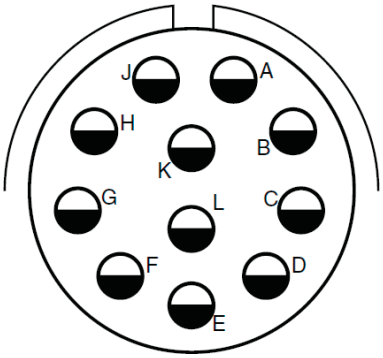
Note:

1. An "X" is used to indicate signals for Motor A or B. +/- indicates differential pairs.

Connector Pinouts

Interfaces for each of the six connectors are shown in this section. See each respective diagram for the pinout numbering. See page 5 for the connector part number and mating connector information. See page 9-10 for the location of the connectors.

J1 ⟨Power⟩ Pinout Assignments

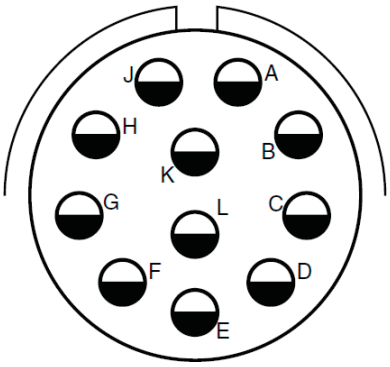


(View looking into chassis pins)

J1 connector provides Power Input on an 11-contact connector

J1 Pin	Name	I/O	Description	Current Rating (A)	Wire Gauge	Type
A	Vbus	IN	Bus Voltage, (V_{BUS}), Motor Power	23	14-12	DC Bus Voltage Input
B	Vbus	IN	Bus Voltage, (V_{BUS}) , Motor Power	23	14-12	DC Bus Voltage Input
C			Reserved for factory use only	23	14-12	No Connect
D			Reserved for factory use only	23	14-12	No Connect
E			Reserved for factory use only	23	14-12	No Connect
F	Vbus_RTN	IN	Bus Voltage Return	23	14-12	DC Bus Return
G	Vbus_RTN	IN	Bus Voltage Return	23	14-12	DC Bus Return
H			Reserved for factory use only	23	14-12	No Connect
J			Reserved for factory use only	23	14-12	No Connect
K			Reserved for factory use only	23	14-12	No Connect
L	CH_GND	---	Chassis Ground	23	14-12	Chassis Ground

J2 ⟨Motor⟩ Pinout Assignments, 20A units



(View looking into chassis sockets)

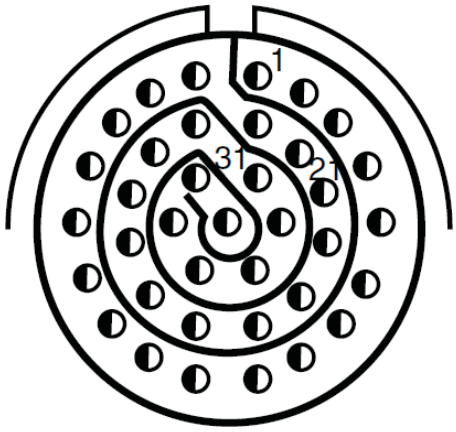
J2 connector provides Motor Power Output on an 11-contact connector.

J2 Pin	Name	I/O	Description	Current Rating (A)	Wire Gauge	Type
A	A_MA	OUT	Motor A Phase A	23	14-12	Motor Power
B	B_MA	OUT	Motor A Phase B	23	14-12	Motor Power
C	C_MA	OUT	Motor A Phase C	23	14-12	Motor Power
D	CH_GND	---	Chassis	23	14-12	Chassis Ground
E	A_MB	OUT	Motor B Phase C (1)	23	14-12	Motor Power
F	B_MB	OUT	Motor B Phase B (1)	23	14-12	Motor Power
G	C_MB	OUT	Motor B Phase A (1)	23	14-12	Motor Power
H	REGEN-	OUT	Regeneration (-)	23	14-12	Regeneration
J	REGEN+	OUT	Regeneration (+)	23	14-12	Regeneration
K	INTERLOCK+	IN	Interlock (+)	23	14-12	Interlock
L	INTERLOCK-	IN	Interlock (-)	23	14-12	Interlock

Note:

1. Motor B connections for second motor in Dual-axis Configurations. Also, Motor B Phase pins (K, J & H) are used in Paralleled with Motor A Phase pins A, B, & C (respectively) for Single-axis drives with continuous current requirements greater than 20 A.

J3 ⟨System⟩ Pinout Assignments



(View looking into chassis pins)

J3 connector provides communication on a 37-contact connector.

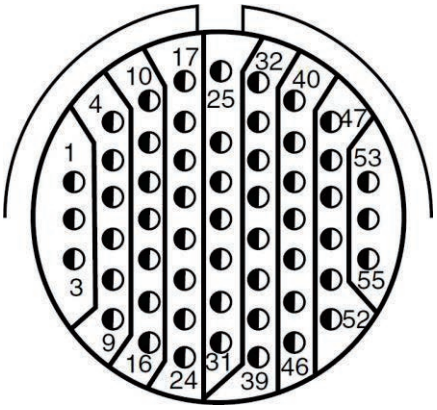
J3 Pin	Name	I/O	Description	Wire Gauge	Type
1	CH_GND	---	Chassis	28-22	Chassis Ground
2	28VDC_IN (V_{LOGIC})	IN	Logic Voltage, 28 VDC In (1)	22	Low Voltage Input
3	28VDC_IN (V_{LOGIC})	IN	Logic Voltage, 28 VDC In (1)	22	Low Voltage Input
4	CH_GND	---	Chassis	28-22	Chassis Ground
5	GROUND	---	DC Return / Ground (3)	22	Ground
6	RS422_TX+	OUT	RS422 Tx (+)	28-22	RS-422
7	RS422_TX-	OUT	RS422 Tx (-)	28-22	RS-422
8	RS422_RX+	IN	RS422 Rx (+)	28-22	RS-422
9	RS422_RX-	IN	RS422 Rx (-)	28-22	RS-422
10	SPARE	IN	Spare	28-22	No Connect
11	SPARE	IN	Spare	28-22	No Connect
12	GROUND	---	DC Return / Ground (3)	22	Ground
13	SPARE	IN	Spare	28-22	No Connect
14	GROUND	---	DC Return / Ground (3)	22	Ground
15	ANALOG_IN_1+ (CMD+_MA)	IN	Analog In 1 (+), *can be used as* Command Positive Motor A	28-22	Analog Differential In
16	ANALOG_IN_1- (CMD-_MA)	IN	Analog In 1 (-), *can be used as* Command Negative Motor A	28-22	Analog Differential In
17	ANALOG_IN_2+ (CMD+_MB)	IN	Analog In 2 (+), *can be used as* Command Positive Motor B	28-22	Analog Differential In
18	ANALOG_IN_2- (CMD-_MB)	IN	Analog In 2 (-), *can be used as* Command Negative Motor B	28-22	Analog Differential In
19	GROUND	---	DC Return / Ground (3)	22	Ground

J3 Pin	Name	I/O	Description	Wire Gauge	Type
20	USB_D+	I/O	USB DP	28-22	USB Data
21	USB_D-	I/O	USB DN	28-22	USB Data
22	USB_VBUS	IN	USB Voltage Sense (4)	28-22	USB Voltage Sense Input
23	GROUND	---	Ground (3)	22	Ground
24	SPARE	---	Spare	28-22	No Connect
25	GROUND	---	Ground (3)	22	Ground
26	SPARE	IN	Spare	28-22	No Connect
27	ATP1	OUT	Analog Test Point 1 Out	28-22	Analog TP Out
28	ATP2	OUT	Analog Test Point 2 Out	28-22	Analog TP Out
29	Do not connect		Reserved for factory use only		No Connect
30	Do not connect		Reserved for factory use only		No Connect
31	SPARE	---	Spare	28-22	No Connect
32	GROUND	---	Ground (3)	22	Ground
33	CAN-A+	I/O	CAN-A H	28-22	CAN Bus A
34	CAN-A-	I/O	CAN-A L	28-22	CAN Bus A
35	CAN-B+	I/O	CAN-B H	28-22	Isolated CAN Bus B
36	CAN-B-	I/O	CAN-B L	28-22	Isolated CAN Bus B
37	5VDC_EXT	OUT	5 VDC Out (2)	28-22	Voltage Output

NOTES:

1. The 28V_Return for V_{LOGIC} is GND (Ground)
2. 500 mA max. total sum for all 5VDC_Out pins
3. Pins 19 & 23 can be used as Low Voltage Input Return, Digital Ground, Fan Power Return, USB Ground and/or 5 VDC Out Return.
4. USB_Vbus Sense Input: Connect to USB network's 5V. A 5 V signal on this pin indicates a USB network connection (threshold minimum: 1.0V).

J4 ⟨Feedback⟩ Pinout Assignments



(View looking into chassis *pins)*

J4 connector provides Feedback on a 55-contact connector.

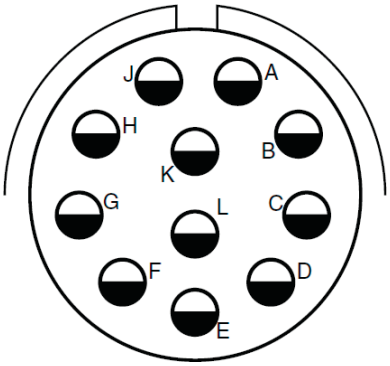
J4 Pin	Name	I/O	Wire Gauge	Type
1	Chassis Ground (Shield)	---	28-22	Chassis Ground
2	Resolver MA Excitation (+)	OUT	28-22	Resolver
3	Resolver MA Excitation (-)	OUT	28-22	Resolver
4	Resolver MA Sin (+) or ANALOG_IN_3+ (3)	IN	28-22	Resolver
5	Resolver MA Sin (-) or ANALOG_IN_3- (3)	IN	28-22	Resolver
6	Resolver MA Cos (+) or ANALOG_IN_4+ (3)	IN	28-22	Resolver
7	Resolver MA Cos (-) or ANALOG_IN_3- (3)	IN	28-22	Resolver
8	Resolver MB Excitation (+)	OUT	28-22	Resolver
9	Resolver MB Excitation (-)	OUT	28-22	Resolver
10	Resolver MB Sin (+) or ANALOG_IN_5+ (3)	IN	28-22	Resolver
11	Resolver MB Sin (-) or ANALOG_IN_5- (3)	IN	28-22	Resolver
12	Resolver MB Cos (+) or ANALOG_IN_6+ (3)	IN	28-22	Resolver
13	Resolver MB Cos (-) or ANALOG_IN_6- (3)	IN	28-22	Resolver
14	Thermistor MA (+)	IN	28-22	Temp. Sensor
15	Thermistor MA (-)	IN	28-22	Temp. Sensor
16	Thermistor MB (+)	IN	28-22	Temp. Sensor
17	Thermistor MB (-)	IN	28-22	Temp. Sensor
18	5 VDC Out (1)	OUT	28-22	Voltage Output
19	DC return (2)	---	28-22	Ground
20	Encoder MB A (+) or MB BiSS-C Clock (+) (3)	IN	28-22	Encoder
21	Encoder MB A (-) or MB BiSS-C Clock (-) (3)	IN	28-22	Encoder
22	Encoder MB B (+)	IN	28-22	Encoder
23	Encoder MB B (-)	IN	28-22	Encoder
24	Encoder MB I (+) or MB BiSS-C Data (+) (3)	IN	28-22	Encoder

J4 Pin	Name	I/O	Wire Gauge	Type
25	Encoder MB I (-) or MB BiSS-C Data (-) (3)	IN	28-22	Encoder
26	MA Brake (-) (4)	IN	28-22	Brake
27	MA Brake (+) (4)	IN	28-22	Brake
28	MB Brake (-) (4)	IN	28-22	Brake
29	MB Brake (+) (4)	IN	28-22	Brake
30	5 VDC Out (1)	OUT	28-22	Voltage Output
31	DC Return (2)	---	28-22	Ground
32	Encoder MA A (+) or MA BiSS-C Clock (+) (3)	IN	28-22	Encoder
33	Encoder MA A (-) or MA BiSS-C Clock (-) (3)	IN	28-22	Encoder
34	Encoder MA B (+)	IN	28-22	Encoder
35	Encoder MA B (-)	IN	28-22	Encoder
36	Encoder MA I (+) or MA BiSS-C Data (+) (3)	IN	28-22	Encoder
37	Encoder MA I (-) or MA BiSS-C Data (+) (3)	IN	28-22	Encoder
38	Hall MB A	IN	28-22	Hall Effect
39	Hall MB B	IN	28-22	Hall Effect
40	Hall MB C	IN	28-22	Hall Effect
41	5 VDC Out (1)	OUT	28-22	Voltage Output
42	DC Return	---	28-22	Ground
43	Hall MA A	IN	28-22	Hall Effect
44	Hall MA B	IN	28-22	Hall Effect
45	Hall MA C	IN	28-22	Hall Effect
46	5 VDC Out (1)	OUT	28-22	Voltage Output
47	DC Return	---	28-22	Ground
48	Spare	---	28-22	No Connect
49	Spare	---	28-22	No Connect
50	Spare	---	28-22	No Connect
51	Spare	---	28-22	No Connect
52	Spare	---	28-22	No Connect
53	Spare	---	28-22	No Connect
54	Spare	---	28-22	No Connect
55	Spare	---	28-22	No Connect

NOTES:

1. 500 mA max. total sum for all 5VDC_Out pins.
2. Pins 19 & 31 can be used as 5 VDC Out Return and/or Digital Ground.
3. The signals are software/application selectable.
4. The Draco provides two 28-volt brake drivers. The brake current is nominally 1 Amp and is current limited to 1.5 Amps +- 10%.

J5 〈Motor A〉 Pinout Assignments



(View looking into chassis *sockets)*

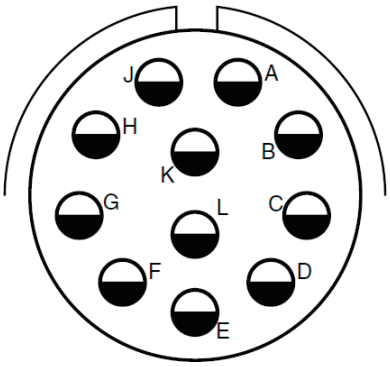
J5 connector provides Motor A Power Output on an 11-contact connector.

J5 Pin	Name	I/O	Description	Current Rating (A)	Wire Gauge	Type
A	A	OUT	Motor A Phase A	23	12	Motor Power
B	A	OUT	Motor A Phase A	23	12	Motor Power
C	A	OUT	Motor A Phase A	23	12	Motor Power
D	B	OUT	Motor A Phase B	23	12	Motor Power
E	B	OUT	Motor A Phase B	23	12	Motor Power
F	B	OUT	Motor A Phase B	23	12	Motor Power
G	C	OUT	Motor A Phase C	23	12	Motor Power
H	C	OUT	Motor A Phase C	23	12	Motor Power
J	C	OUT	Motor A Phase C	23	12	Motor Power
K	---	---	Unused	23	14-12	No Connect
L	CH_GND	---	Chassis Ground	23	14-12	Chassis Ground

NOTE:

1. Connectors J5 and J6 can be used in Paralleled for motors with up to 120A of current.
2. 60A/120A coming soon

J6 〈Motor B〉 Pinout Assignments



(View looking into chassis *sockets)*

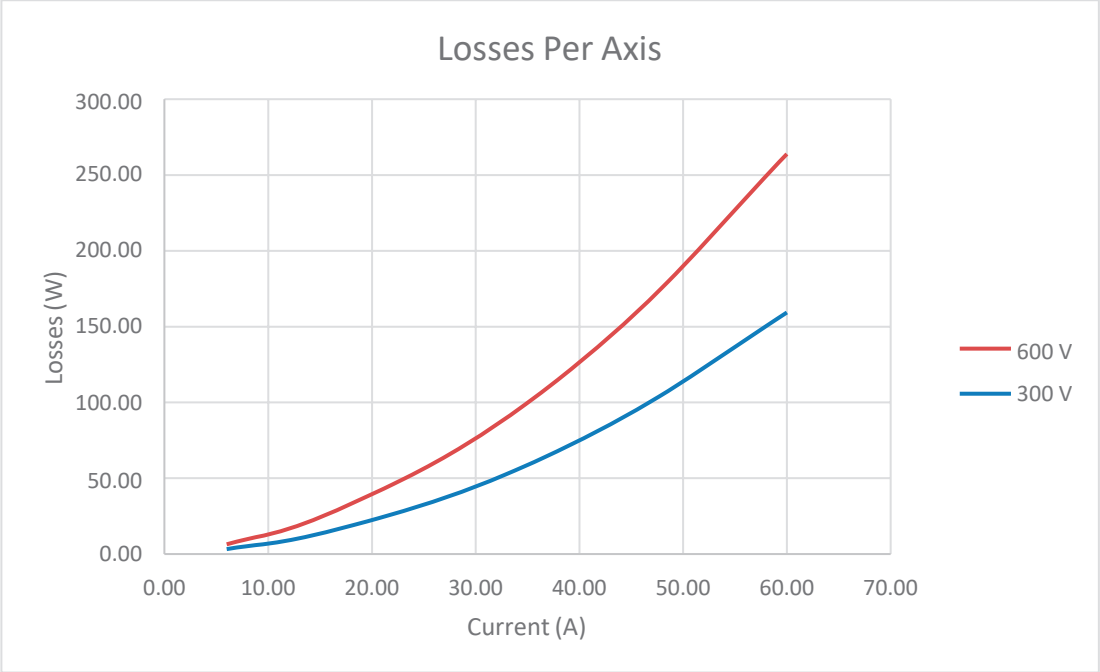
J6 connector provides Motor B Power Output on an 11-contact connector.

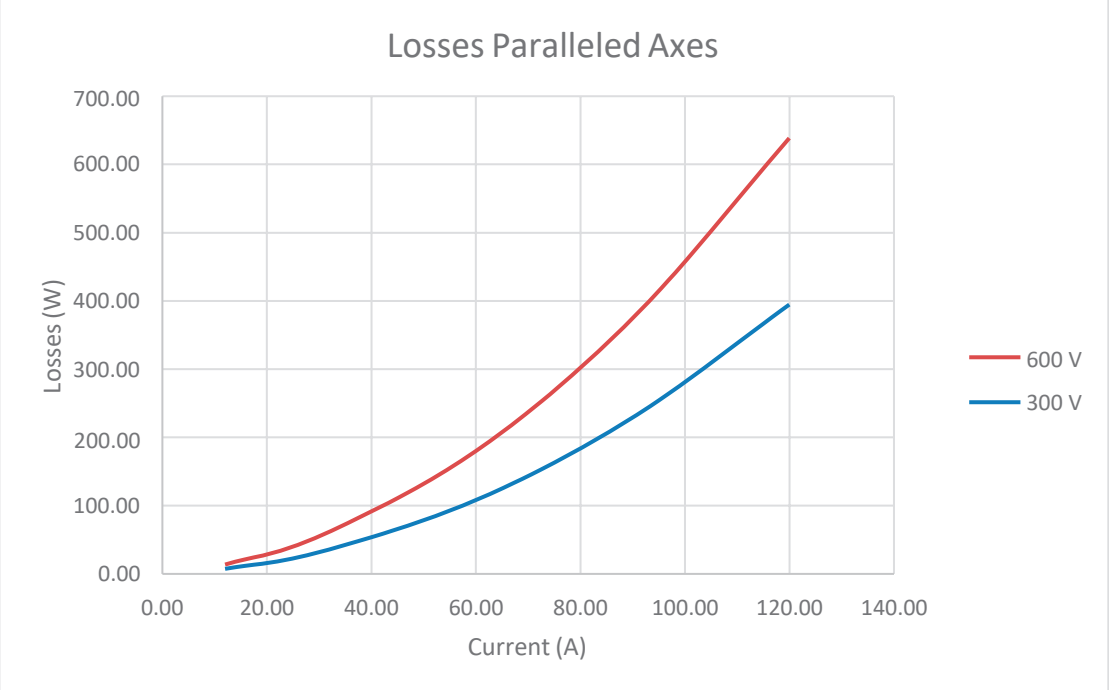
J5 Piin	Name	I/O	Description	Current Rating (A)	Wire Gauge	Type
A	A	Out	Motor B Phase A	23	12	Motor Power
B	A	Out	Motor B Phase A	23	12	Motor Power
C	A	Out	Motor B Phase A	23	12	Motor Power
D	B	Out	Motor B Phase B	23	12	Motor Power
E	B	Out	Motor B Phase B	23	12	Motor Power
F	B	Out	Motor B Phase B	23	12	Motor Power
G	C	Out	Motor B Phase C	23	12	Motor Power
H	C	Out	Motor B Phase C	23	12	Motor Power
J	C	Out	Motor B Phase C	23	12	Motor Power
K	---	---	Unused	23	14-12	No Connect
L	CH_GND	---	Chassis Ground	23	14-12	Chassis Ground

NOTE:

1. Connectors J5 and J6 can be used in Paralleled for motors with up to 120A of current.
2. 60A/120A coming soon

Power Loss Curves





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Ordering Information

Draco Servo Drive Configuration Options

CD XXA YYYV DC 1 S

Servo Drive	Nominal Continuous Current[1]	Nominal Voltage	Voltage Type	Cooling	Configuration
DC=Draco	20 – 20A 40 – 40A [2] 60 – 60A 80 – 80A [2] 120 – 120A [2]	300 – 300V 600 – 600V	DC – DC	1 – Chassis 2 – Liquid	S – Single-axis D – Dual-axis P – Single Paralleled axes[2]

1) Peak Sine Wave, per axis
2 Paralleled axes

Example: Part Number DC40A300VDC1D
Servo Drive: Draco
Continuous Current: 40A
Nominal Voltage: 300VDC
Feedback: Resolver
Cooling: Chassis
Configuration: Dual-axis

Model Availability List

Single-axis (including Paralleled Axes):

120A/80A	*DC120A300VDC1P* *DC120A300VDC2P*	***DC80A600VDC1P*** *DC80A600VDC2P*
60A/40A	DC60A300VDC1S DC60A300VDC2S	**DC40A600VDC1S** DC40A600VDC2S
40A	***DC40A300VDC1P*** *DC40A300VDC2P*	***DC40A600VDC1P*** *DC40A600VDC2P*
20A	**DC20A300VDC1S** DC20A300VDC2S	**DC20A600VDC1S** DC20A600VDC2S
A/V	300V	600V

Dual-axis:

60A/40A	DC60A300VDC1D DC60A300VDC2D	**DC40A600VDC1D** DC40A600VDC2D
20A	**DC20A300VDC1D** DC20A300VDC2D	**DC20A600VDC1D** DC20A600VDC2D
A/V	300V	600V

Notes:
1. Standard Products are shown in **bold**, and have expedited lead times.
2. 40A and 120A/80A variants (in *italics*) utilise Paralleled connections to both Motor A & B Power to drive the single-axis 40A and 120A/80A
3. 60A/120A coming soon

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Olsen Actuators is the brainchild of Piers Olsen, an engineer with decades of experience and success in developing solutions for challenging applications in the most demanding environments. Building on his experience, the company has developed a world-class command of actuator technology and a deep understanding of user requirements.

Olsen Actuators offers so much more than components. We are a market leader in the customisation and integration of electromechanical systems, and our unparalleled expertise is built into everything we supply, whether it's a single actuator or a complex control system.

We look at applications holistically and assess their long-term performance and impact to provide solutions that are not only right for the present but also future-proof. We support our products and systems at every stage, from pre-programming through to commissioning and beyond – all for your peace of mind.

For us, the total product lifecycle is essential, so all of our components are tested in our in-house application simulation and testing facilities. We make extensive use of lifetime software modelling technology to ensure that our solutions always meet customers' performance and duty cycle requirements and will continue to do so for many years to come.

We are also committed to helping our customers save energy and all of our products and solutions are developed with this in mind. Since electric actuators only use electricity when moving, they are significantly more energy-efficient than their hydraulic and pneumatic counterparts. Quiet, reliable and effective, electric actuators are the best solution for almost every application.

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In addition to our key industries, we are also lucky to have projects we are personally passionate about. Projects we love include:

- Electric vehicles, including eVTOL aircraft (electric vertical takeoff and landing)
- SMR (small modular reactors)
- Gravitational energy storage
- Quantum computing
- Space exploration and settlement
- Tidal generation
- New battery technology
- Subsea electric vehicles and valves

Essentially, we are really into projects we believe can help change the world for the better.

So give our experienced engineering team a call and tell them about your challenges. We'll offer an outstanding solution that will keep your systems moving for years to come!

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Mil-Spec Ratings

Actuators

- MIL-S-167 Mechanical Vibration of Shipboard Equipment
- MIL-S-901 High Impact Shock Testing for Shipboard Equipment
- MIL-STD-108 Environmental Capability for Electronic Equipment
- MIL-STD-461 Control of Electromagnetic Interference
- MIL-STD-810 Environmental Compatibility, Ground Vehicle Shock & Vibration EMI/RFI to EPRI TR102323 and Reg. Guide 1.180
- Environmental qualification to IEEE 323
- Seismic qualification to IEEE 344
- Software V&V to EPRI-TR-106439 and Reg. Guide 1.152.
- The system's actuator and speed probes will be qualified for harsh environmental applications (radiation limit of 1 X 106),
- The digital controller and servo amplifier can be qualified for mild environmental applications (radiation limit of 6 X 103).
- Seismic qualification criteria for the system will be Category 1, and all components will meet EMI/RFI requirements.
- For harsh environmental applications, the controller and servo-amplifier can be remotely operated up to 1,000 feet from the turbine containment area.

Drives

- DO-178 A,B,C OPTION Aircraft
- MIL-STD-810G Shock & Vibration
- MII-STD-461 Control of Electromagnetic Interference
- MIL-STD-254 Parts Traceability
- MIL-704F Power supply
- DO-160G Voltage spikes
- Cosmic Radiation Protection
- Duplex CAN bus Fail Over
- Gallium Nitride FETS
- -55 °C TO +100 °C (Celsius)
- 40-100 kHz Switching Frequency
- AS9100D Certified
- Graphical User Interface (GUI)

Complying with a wide range of defence and industry standards, options include a selection of input voltages, output current amplitudes, and feedback devices. It comes with an industry benchmark user interface allowing the most flexible and precise system integration and control.

- **Custom modification of servo drive system packaging, feedback options, and other features**
- **Continuous customer support throughout the development and deployment process**
- **Thorough and accurate documentation, including AS9100D Certification**
- **Rigorous testing and application of necessary standards**
- **Product development consultation**

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